Claims

[c1] 1. A monitoring system comprising:

at least one partial discharge (PD) sensor, which is configured to monitor a component of an aircraft wiring system and to acquire a monitoring signal.

[c2] 2.The monitoring system of Claim 1, wherein said PD sensor comprises a capacitive coupling sensor, which includes a conductive layer encompassing the component.

[c3] 3.The monitoring system of Claim 2, wherein the component comprises a conductive core surrounded by an insulating layer, wherein said capacitive coupling sensor further includes a capacitance enhancing layer which extends around the insulating layer, and wherein said conductive layer extends around said capacitance enhancing layer.

[c4] 4.The monitoring system of Claim 2, wherein the component comprises a plurality of wires, each wire comprising a conductive core surrounded by an insulating layer, wherein said capacitive coupling sensor further includes a capacitance enhancing layer which extends around the wires, and wherein said conductive layer extends around said capacitance enhancing layer.

[c5] 5.The monitoring system of Claim 1, wherein said PD sensor comprises a high frequency current transformer (HFCT) sensor encompassing the component.

[c6] 6.The monitoring system of Claim 5, wherein the component comprises a conductive core surrounded by an insulating layer, and wherein said HFCT sensor extends around the insulating layer.

[c7] 7.The monitoring system of Claim 5, wherein the component comprises a plurality of wires, each wire comprising a conductive core surrounded by an insulating layer, wherein said HFCT sensor extends around the wires.

[c8] 8.The monitoring system of Claim 1, further comprising a monitoring unit, which includes said PD sensor.

[c9] 9.The monitoring system of Claim 8, wherein said monitoring unit comprises an

in-line monitoring unit, wherein the component comprises a first wire set including at least one wire, a first connector connected to the first wire set, a second wire set including at least one wire, and a second connector connected to the second wire set, and wherein said in-line monitoring unit is positioned between the first and second connectors.

[c10] 10.The monitoring system of Claim 9, wherein said in-line monitoring unit is configured to matingly connect to the first and second connectors.

[c11] 11.The monitoring system of Claim 8, wherein said monitoring unit comprises a self-monitoring unit, wherein the component comprises a wire set, which includes at least one wire and is connected to said self-monitoring unit, wherein said PD sensor is configured to monitor the wire.

[c12] 12.The monitoring system of Claim 8, further comprising:
a data acquisition system, which is configured to receive the monitoring signal; and
at least one hard-wired connector configured to connect said monitoring unit to said data acquisition system for conveying the monitoring signal.

[c13] 13.The monitoring system of Claim 8, wherein said monitoring unit further comprises a transmitter, which is configured to transmit the monitoring signal.

[c14] 14.The monitoring system of Claim 13, further comprising a data acquisition system, which comprises:
a receiver, which is configured to receive the monitoring signal; and
a memory, which is configured to store the monitoring signal.

[c15] 15.The monitoring system of Claim 13, wherein said monitoring unit further comprises a partial discharge (PD) signal discriminator, which is configured to convert the monitoring signal to a multi-level monitoring signal, wherein said transmitter is configured to transmit the multi-level monitoring signal.

[c16] 16.The monitoring system of Claim 15, further comprising a data acquisition system, which comprises:
a receiver, which is configured to receive the multi-level monitoring signal;

a memory, which is configured to store the multi-level monitoring signal; and
a monitor, which is configured to transmit an alert based on the multi-level monitoring signal.

[c17] 17.The monitoring system of Claim 16, further comprising a display, which is configured to display a wire health status based on the multi-level monitoring signal.

[c18] 18.An on-board monitoring system comprising:
a plurality of monitoring units, each monitoring unit being configured to monitor a component of an aircraft wiring system and comprising at least one partial discharge (PD) sensor; and
a data acquisition system, which is configured to receive a plurality of monitoring signals from said monitoring units.

[c19] 19.The on-board monitoring system of Claim 18, wherein at least one of said monitoring units comprises an in-line monitoring unit, wherein the respective component comprises a first wire set including at least one wire, a first connector connected to the first wire set, a second wire set including at least one wire, and a second connector connected to the second wire set, and wherein said in-line monitoring unit is positioned between and matingly connects the first and second connectors.

[c20] 20.The on-board monitoring system of Claim 18, wherein at least one of said monitoring units comprises a self-monitoring unit, wherein the respective component comprises a wire set including at least one wire and connected to said self-monitoring unit, and wherein said PD sensor is configured to monitor the wire.

[c21] 21.The on-board monitoring system of Claim 18, wherein at least one of said monitoring units further comprises:
a partial discharge (PD) signal discriminator, which is configured to convert the monitoring signal to a multi-level monitoring signal, and
a transmitter, which is configured to transmit the multi-level monitoring signal, and

wherein said data acquisition system comprises:
a receiver, which is configured to receive the multi-level monitoring signal,
a memory, which is configured to store the multi-level monitoring signal, and
a monitor, which is configured to transmit an alert based on the multi-level monitoring signal.

[c22] 22.The on-board monitoring system of Claim 21, wherein the respective component comprises a plurality of wires,
wherein said monitoring unit comprises a plurality of PD sensors and a plurality of PD signal discriminators, one PD signal discriminator being provided for a respective PD sensor,
wherein each of said PD sensors is configured to monitor a respective one of the wires,
wherein each of said PD signal discriminators is configured to convert each of the monitoring signals from a respective PD sensor to a respective multi-level monitoring signal, and
wherein said transmitter is configured to transmit each of the multi-level monitoring signals over a respective wireless channel.

[c23] 23.The on-board monitoring system of Claim 21, further comprising:
at least one hard-wired connector configured to connect at least one of said monitoring units to said data acquisition system for conveying the monitoring signal.

[c24] 24.A method for monitoring an aircraft wiring system, said method comprising:
acquiring a plurality of monitoring signals for a plurality of components of the aircraft wiring system using a plurality of partial discharge (PD) sensors; and
conveying the monitoring signals from at least one of the PD sensors to a data acquisition system.

[c25] 25.The method of Claim 24, further comprising:
converting each of the monitoring signals to a multi-level monitoring signal,
wherein said conveying step comprises transmitting each of the respective multi-level monitoring signals over a respective wireless channel and receiving the multi-level monitoring signals,

wherein said method further includes:

storing the multi-level monitoring signals in a memory of the data acquisition system; and

transmitting an alert, if one of the multi-level monitoring signals indicates possible damage to the respective component.

[c26] 26.The method of Claim 25, further comprising displaying a wiring health status for the components based on the multi-level monitoring signals.

[c27] 27.A method for on-board monitoring of an aircraft wiring system, said method comprising:

acquiring a plurality of monitoring signals for a respective plurality of components of the aircraft wiring system using a plurality of partial discharge (PD) sensors;

conveying the monitoring signals from at least one of the PD sensors to a data acquisition system;

converting each of the monitoring signals to multi-level monitoring signals;

conveying the multi-level monitoring signals to a data acquisition system;

storing the multi-level monitoring signals in a memory of the data acquisition system;

transmitting an alert, if one of the multi-level monitoring signals indicates possible damage to the respective component; and

displaying a wiring health status for the components based on the multi-level monitoring signals.

[c28] 28.A monitoring system comprising:

a test interface, which is configured to connect to a component of an aircraft wiring system, said test interface comprising at least one partial discharge (PD) sensor, which is configured to monitor the component and acquire a monitoring signal; and

a data acquisition system which is configured to receive the monitoring signal.

[c29] 29.The monitoring system of Claim 28, further comprising a display, which is configured to display the monitoring signal.

[c30] 30.The monitoring system of Claim 28, wherein the component comprises a wire set including at least one wire and a connector connected to the wire set, and wherein said test interface is configured to matingly connect to the connector.

[c31] 31.The monitoring system of Claim 28, wherein the component comprises a wire set, which includes a plurality of wires, and a connector connected to the wire set, and

wherein said test interface is configured to matingly connect to the connector and comprises an automated multiplexing test interface, which is configured to automatically monitor each of the wires using said PD sensor.